NORTH ATLANTIC HURRICANES AND TROPICAL DISTURBANCES OF 1946

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The hurricane season of 1946 passed uneventfully without the loss of a single life in the United States and with property damage confined to less than 10 million dollars. Compared with $80,000,000 damage in 1945 and over $150,000,000 damage in 1944, this figure indicates the comparatively mild nature of the year's tropical storms by the time they reached the coast line of the United States. The total of six tropical disturbances detected in the North Atlantic area during the past season was below the seasonal average of 8.5, an average based on the last 20 years of record. A total of 53 official advisories and warnings were issued by the Weather Bureau for these 6 tropical disturbances.

Only once during the year was the coast line seriously threatened by a hurricane of major proportions. On October 7, aircraft reconnaissance indicated that a storm center, encircled by winds reaching velocities of 115 knots, was moving north-northeastward in the Gulf of Mexico towards the Tampa Bay area. This storm quickly lost intensity during its last few hours over the Gulf, however, and caused relatively little damage as it moved across the Florida Peninsula from Tampa to a point slightly west of Jacksonville.

Of the five other tropical disturbances, one moved across the North Carolina coast near Wilmington, one crossed the Bahamas and moved northeastward off the Atlantic coast into Newfoundland, and one reached the Texas coast west of Port Arthur. The fourth moved inland south of Tampico, Mexico; while the last, a minor disturbance, moved westward from the Bahamas and passed over the east Florida coast near Palm Beach.

For the fourth year aircraft reconnaissance played a major role in locating the centers of hurricanes and tropical disturbances as well as in determining their rate of forward movement and the wind velocities within their circulations. Knowledge of these factors is invaluable in issuing reliable warnings.

The following are reviews of all North Atlantic hurricanes and tropical disturbances that occurred during the 1946 season. A synopsis of the important features of these storms is given in table 2; their tracks, numbered I to VI chronologically, are plotted on Chart I.

I. *Weak tropical disturbance of June 14–16.*—This disturbance, accompanied by a small area of squally weather with winds of 25–35 miles per hour, was first detected near latitude 29.0° N., longitude 86.5° W., about 110 miles south of Valparaiso, Fla. The center moved west-northwestward during its 3-day life span, and passed inland on the Texas coast near Port Arthur on the 16th, attended by winds of gentle to moderate force. The highest wind velocity recorded was 36 miles per hour at Grand Isle, La., on June 15, at 1:30 a. m. No damage or loss of life was reported, although the sea was very rough in Mississippi Sound as the disturbance, traveling westward, moved across the Gulf to the south.

II. *Tropical disturbance of July 5–10.*—A small tropical disturbance moved north-northeastward along the coast of South Carolina during July 5, and at 6 a. m., on the 6th moved inland over North Carolina in the vicinity of Wilmington. At 5:50 a. m., on the 6th, during passage of the center over Wilmington, the barometer there reached a low of 29.71 inches (1,006.1 millibars). A maximum wind velocity of 30 miles per hour (with gusts estimated at 45 miles per hour) was recorded at Wilmington at 1 a. m., some 5 hours before passage of the center. Reports from Carolina and Wrightsville beaches indicate that winds reached 45 miles per hour (50–60 miles per hour in gusts) in that area.

Although there was some voluntary evacuation of beach property, little damage was reported to property of this type. In and near Wilmington wind damage was limited to plate-glass breakage and a short interruption of power and communication services. However, considerable crop damage (15 to 20 percent in some areas) resulted from the heavy rainfall.

As the storm moved seaward on July 6, between Cape Hatteras and Elizabeth City, N. C., it showed marked signs of greater intensity. During the next 4 days the center moved northeastward some distance off the coast and by the morning of the 10th reached a point southeast of Newfoundland.

III. *Minor tropical disturbance of August 25.*—Although the lack of a trade inversion over Swan Island, West Indies, during the several days previous indicated that conditions were favorable for the formation of a tropical disturbance in the vicinity, no development was detected until the morning of August 25, when reconnaissance flights located a well-defined circulation east of Tampico. The disturbance moved west-northwestward and passed inland a short distance south of Tampico, Mexico, dissipating rapidly during the night as it reached the mountains west of Tampico. No loss of life or property damage was reported.

IV. *Hurricane of September 12–15.*—On the 11th of September an area of falling pressure was noted over the Bahama Islands, with a minimum pressure over Andros Island. By 7:30 a. m., of the 12th there were evidences of a weak cyclonic circulation, and reconnaissance flights were arranged for the forenoon and afternoon. The afternoon flight located a definite center with an "eye" about 8 miles in diameter, surrounded by a 5-mile wide ring of winds with speeds up to 55 knots. At 4 p. m., of the 12th the area of high winds was about 20 miles in diameter, with the center located about 125 miles east of Miami, Fla., and 90 miles northwest of Nassau. The center passed over Great Abaco Island, Bahamas, about midnight. Hopetown reported a west wind of 65 miles per hour; gusts of higher velocity; and a low pressure at the center of 29.38 inches (994.9 millibars).

Continuing a northeastward movement over the Atlantic, the disturbance soon developed to full hurricane force. A reconnaissance plane flew into the center at about 1:30 p. m. of the 13th, near latitude 29.2° N., longtiude 73.8° W., and encountered winds of 85 to 90 knots. On this flight the central pressure was reported as 28.80 inches (975.3 millibars). Several hours earlier the *S. S. St. Cloud* was involved in the hurricane near latitude 28.7° N., longitude 74.8° W., and reported winds of 100 miles per

hour. During the 14th and 15th the forward movement of the storm increased at a rapid rate as it moved northeastward some distance off the Atlantic coast. It skirted Nova Scotia on the 15th and, diminishing in intensity, passed into Newfoundland accompanied by winds reduced to gale force.

V. *Florida hurricane of October 6–9.*—Late on October 5 a poorly defined cyclonic circulation passed northeastward from Guatemala into the Caribbean Sea. The forward movement of this low pressure area slowed to about 12 miles per hour as it moved out over the waters of the Caribbean, and between 1:30 p. m. of the 5th and 7:30 a, m. of the 6th, the central pressure fell from 1,005.0 millibars to 993.0 millibars, with winds increasing to over 50 miles per hour. During the late afternoon of the 6th winds of 85 miles per hour were measured from aircraft and surface vessels.

During the following night the center crossed extreme western Cuba, with the station at San Julian, Cuba, reporting gusts reaching 112 miles per hour. Moving into the Gulf, the center passed a short distance west of Dry Tortugas, which, at 12:30 p. m. on the 7th, recorded an extreme wind velocity of 84 miles per hour from the south. Several ships west of this island reported winds of 80–100 knots, and a reconnaissance plane flying into the center estimated a wind of 115 knots (132 miles per hour).

After passing the latitude of Dry Tortugas the storm began to lose intensity, as indicated by reports from a plane that flew into the storm at 4:18 p. m., while it was centered about 100 miles west-southwest of Fort Myers; no winds greater than 85 knots (98 miles per hour) were reported.

As the storm approached the Florida coast, the ring of hurricane-force winds, which probably never exceeded 50 miles in width, was destroyed at the surface, leaving a poorly defined and relatively flat central area surrounded by a broad circulation of gale-force winds. Some Florida stations directly in the path of the storm reported winds which gradually decreased from 40–50 miles per hour down to 15–20 miles per hour, and gradually increased again, without any relatively calm period intervening. Others reported a complete calm for periods of as long as 1 hour. No stations reported the rapid transition in wind conditions which is characteristic of the approach and passage of a hurricane "eye." However, a short distance above the surface, there seemed to be little disruption of the hurricane-force winds. Several stations reported very rapidly moving low clouds at the height of the storm, with only fresh surface winds; and one observer stated that while small trees were being gently swayed by the wind at the peak of the storm, the tops of taller pines in the same field were being violently twisted and sheared. Along the west Florida coast the maximum winds reported were 75 miles per hour. These high velocities were reported from stations to the right of the center of the storm, in the Fort Myers-Punta Gorda section. Tampa, over which the calm center passed about midnight, reported a highest wind of only 47 miles per hour.

The forward movement of the hurricane accelerated rapidly during the 7–8th, from about 14 miles per hour upon leaving Cuba to 33 miles per hour when passing over Florida and southeastern Georgia. Coming to an abrupt stop between Columbia, S. C., and Augusta, Ga., on the 8th, it continued to lose force. Heavy rains spread over the Carolinas and Virginia, with diminishing winds. After remaining stationary for about 18 hours, the weak low-pressure system moved over the North Carolina Capes into the Atlantic.

The greatest damage in Florida was to the citrus crop, and was estimated at 2 percent, or 2,000,000 boxes of fruit, at $2.50 per box, amounting to $5,000,000. In some west coast counties, such as Sarasota, Charlotte, and Lee, the loss ran to 10 percent for oranges and 15–20 percent for grapefruit, but the production in these counties is small compared to the total crop.

Other property damage was confined to about $200,000, most of which resulted from unusually high tides along the west Florida coast. The town of Everglades was inundated to depths ranging from 1½ to 3 feet. Parts of Punta Gorda and Fort Myers were also flooded, as were low beaches and islands from Tampa Bay to the Keys.

TABLE 1.— *Meteorological data for hurricane of Oct. 6–9, 1946*

[All times eastern standard]

Station	Date of observation	Lowest pressure reported (inches)[1]	Time of lowest pressure	Maximum wind velocity for a 5-minute period	Time of maximum velocity	Extreme wind velocity (fastest mile from register)	Time of extreme velocity	Velocity of extreme gust	Miscellaneous
Alligator Light, Fla.	7	29.60	2:30 p. m.	61 SE	8:57 a. m.	64 SE	9:00 a. m.		
Brunswick, Ga.	8	29.20	7:15 a. m.	39 SE	8:15 a. m.	40 S	8:45 a. m.	50 SE	Tide, +9.5 ft.
Carysfort Reef Light, Fla.	7	29.67	7:00 p. m.	51 SE	8:00 a. m.				Duration of gale winds, 13 hours.
Charleston, S. C.	8	29.39	2:30 p. m.	28 SSE	12:50 p. m.			55	
Cortez, Fla.	7	28.95	10:30 p. m.						Tide, +3.0 ft.
Daytona Beach, Fla.	8	29.33	3:00 a. m.			65 SSE	3:00 a. m.		Tide, +2.0 ft. Rain 2.32 inches.
Dry Tortugas, Fla.	7			80 S	12:30 p. m.	84 S	12:30 p. m.		Duration of gale winds, 29 hours.
Everglades, Fla.	7	29.55	7.00 p. m.						Tide, +5.0 ft. Rain, 0.72 inches.
Fort Myers, Fla.	7	29.31	9:15 p. m.			58 ESE	8:27 p. m.	80 SSE	Duration of gale winds, 5 hours.
Homestead, Fla.	7	29.51	6:00 p. m.	35 SE	6:00 p. m.	40 S	6:00 p. m.		Rain, 2.35 inches.
Jacksonville, Fla. (WBO)	8	29.21	5:50 a. m.	33 S	7:00 a. m.	33 S	7:01 a. m.		Rain, 2.56 inches.
Jacksonville, Fla. (WBAS)	8	29.21	5:50 a. m.			33 ESE	4:33 a. m.	60	
Key West, Fla.	7	29.50	4:00 p. m.	36 SW	7:39 p. m.	38 SW	7:33 p. m.		Tide normal. Rain, 2.01 inches.
Miami, Fla. (WBO)	7	29.61	7:30 p. m.	50 SE	7:23 a. m.	52 SE	7:23 a. m.		Duration of gale winds, 9 hours.
Miami, Fla. (WBAS)	7	29.59	5:26 p. m.			30 SSE	5:26 p. m.		
Ocala, Fla.	8	29.12	3:15 a. m.						Rain, 6. 20 inches.
Okeechobee, Fla.	7	29.53	12:00 mid.	50 SSE	8:45 p. m.	64 SSE	8:45 p. m.		Duration of gale winds, 3.5 hours.
Punta Gorda, Fla.	7	29.16	10:00 p. m.	55 SSE	11:00 p. m.	75 SSE	11:00 p. m.		Tide, +6.0 ft. Rain, 1.06 inches.
St. Petersburg, Fla.	7	29.16	11:50 p. m.	48 NE	10:00 p. m.	62 NE	10:00 p. m.		Duration of gale winds, 4 hours.
Savannah, Ga.	8	29.21	11:15 a. m.	42 S	12:52 p. m.	48 S	1:53 p. m.	55	Rain, 4.25 inches.
Tampa, Fla.	8	29.14	12:30 a. m.	33 W	11:10 a. m.	47 W	11:10 a. m.[2]		Tide, +3.4 ft. Rain, 2.21 inches.
West Palm Beach, Fla.	7	29.60	8:28 p. m.			32 SSE	4:16 p. m.		Rain, 3.09 inches.
Reported extremes		28.95		80 S		84 S		80 SSE	

[1] Reduced to sea level.
[2] Also 47 miles per hour from the northeast on October 7, at 10 p. m.

NOTE.—Under column "velocity of extreme gust," where no direction is given, this direction was not reported.

Slight damage was reported along the Atlantic coast from Titusville, Fla., to Charleston, S. C., mostly from high tides.

No loss of life or serious injury was reported for the Gulf or Atlantic coasts of the United States. However, press reports stated that 5 lives were lost as a result of this hurricane in western Cuba.

A tabular listing of the lowest pressures and the highest wind velocities observed at selected stations during this Florida hurricane is contained in table 1.

VI. *Minor disturbance of October 31–November 2.*—This disturbance developed from a wave formation in the pressure field which was noted moving westward north of Puerto Rico and Hispaniola on October 31. Early on November 1, a rather concentrated fall in pressure was noted as the wave moved through the Bahama Islands. During the morning, aircraft reconnaissance located signs of a forming cyclonic circulation, which was, however, still weak and poorly defined. The highest wind reported from the Bahamas area was Beaufort force 8 (39-46 miles per hour) at West End, Grand Bahama Island, and aboard two ships north of that island.

From the Bahamas the center moved northwestward and passed over the Florida coast near Palm Beach at about 4:30 p. m. on the 1st of November. Wind velocities over Florida at no time exceeded 40 miles per hour, although squalls and winds between 30 and 40 miles per hour were reported from near Miami to Daytona Beach.

Moving more slowly and continuing a northwestward movement, the center reached a location between Lakeland and Orlando, Fla., by 7:30 a. m. on November 2. Thereafter the disturbance deteriorated rapidly, with the remnants finally drifting into the Atlantic near Jacksonville.

In Florida no wind damage occurred, but heavy rains that accompanied the disturbance flooded crops from Lake Okeechobee to the coast, with damage amounting to 50–75 percent of early fall plantings.

TABLE 2.—*North Atlantic hurricanes and tropical disturbances of 1946*

[Number of storm in table corresponds to number of track on Chart I]

Storm	Date	Area where first reported	Coast lines crossed	Maximum wind speed reported	Lowest pressure reported [1]	Place of dissipation	Intensity	Remarks
I	June 14–16	About 110 miles south of Valparaiso, Fla.	Louisiana and Texas.	36 miles per hour at Grand Isle, La.	No data	Extreme southeastern portion of Texas.	Weak disturbance.	No loss of life or damage reported.
II	July 5–10	Off the South Carolina coast.	North Carolina.	30 miles per hour, and estimated gusts of 45 miles per hour at Wilmington, N. C.	1,006.1 millibars (29.71 inches) at Wilmington, N. C.	Atlantic Ocean east of Newfoundland.	About hurricane intensity over the Atlantic.	Minor damage to beach property near Wilmington, N. C.
III	Aug. 25	Southwest Gulf of Mexico.	Mexico	No data	No data	Interior of Vera Cruz.	Not of hurricane intensity.	No loss of life or damage has been reported.
IV	Sept. 12–15	Near Andros Island, Bahamas.	None	100 miles per hour estimated, S. S. *St. Cloud* at 28.7° N. latitude, 74.8° W. longitude.	975.3 millibars (28.80 inches), reconnaissance plane at 29.2° N., latitude, 73.8° W. longitude.	Southern Newfoundland.	Full hurricane	The Norwegian tanker *Marit II* was reported broken in half and sunk, with a loss of sixteen lives, but, since the area of hurricane winds was not closer than 300 miles at the time, the loss cannot be directly attributed to the hurricane.
V	Oct. 6–9	Northwestern Caribbean Sea, south of the Yucatan Channel.	Cuba, Florida, and North Carolina.	115 knots (132 miles per hour) estimated from a reconnaissance plane near 24.1°N., latitude; 83.6° W. longitude.	978.7 millibars (28.90 inches), reconnaissance plane near 26.1° N. latitude, 83.7° W. longitude.	At sea off the North Carolina coast.	do	No loss of life in the United States; 5 killed in Cuba. Damage in Florida estimated at $5,200,000.
VI	Oct. 31–Nov. 2	Atlantic Ocean north of Hispaniola.	Florida	Beaufort force 8 (39–46 miles per hour) at West End, Grand Bahama Island.	No data available for Bahama Islands.	At sea off the South Carolina coast.	Minor disturbance.	No winds over 40 miles per hour in Florida. Several million dollars damage to fall plantings from heavy rains.

[1] Reduced to sea level.

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Tracks of North Atlantic Hurricanes and Tropical Disturbances of 1946